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ABSTRACT

This publication provides an introduction to grain grading and handling for adult students in vocational and technical education programs. Organized in five chapters, the booklet provides a brief overview of the jobs performed at a grain elevator and of the techniques used to grade grain. The first chapter introduces the grain industry and explains the types of jobs available in grain elevators. A field trip is suggested. Chapter 2 explains how grain is priced, while chapter 3 discusses how grain is sampled for storability and value. In chapter 4, the technical method of grading corn is described, while chapter 5 explains grading wheat and soybeans and how such grading differs from corn grading. Several sample problems are provided in the last three chapters, and each chapter contains review questions. An appended booklet provides illustrations of various kinds of corn kernel damage. (KC)

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Grain Grading and Handling

Illinois State Board of Education

Adult, Vocational and Technical Education

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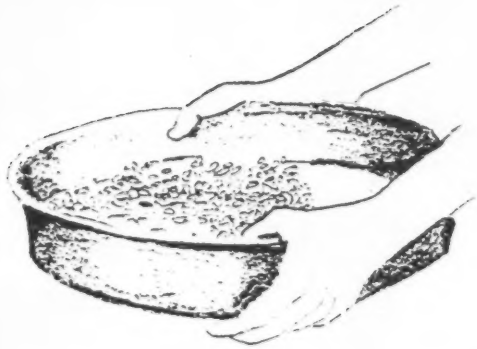

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CHAPTER ONE
WORKING IN THE GRAIN INDUSTRY

Do You Know: How long grain grading has been used?
What an elevator worker is expected to do?
How you can get a job in the grain storage and handling business?
What skills you need to be hired?

Listening to the radio at home or in the car you have probably heard the day's prices for farm products. Every day the price changes, and the information is broadcast over the radio and printed in the newspapers. Hog prices are quoted on the basis of grade: No. 1, No. 2, and so on.

daily corn prices for one month
CBT, U.S. no. 2 corn, 4 pm EST, Oct.16–Nov.14,1980

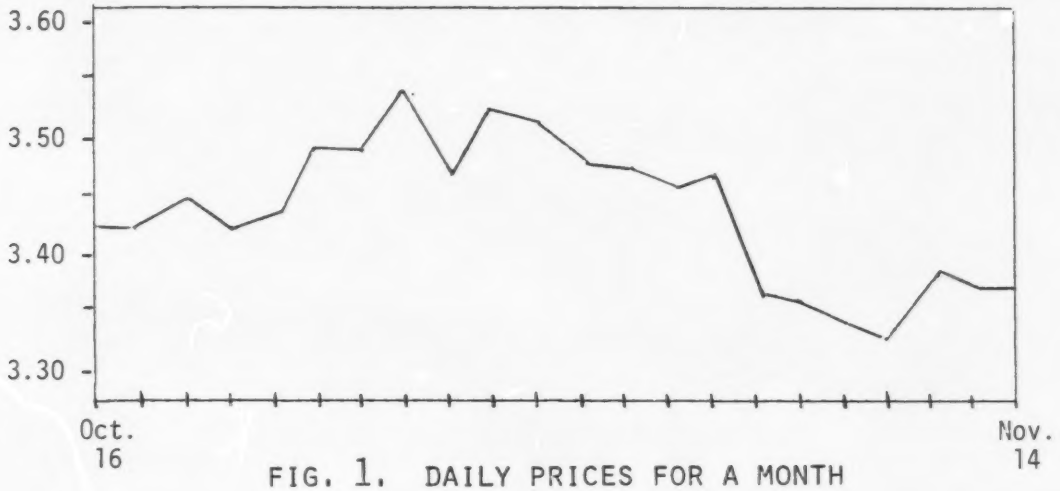


FIG. 1. DAILY PRICES FOR A MONTH

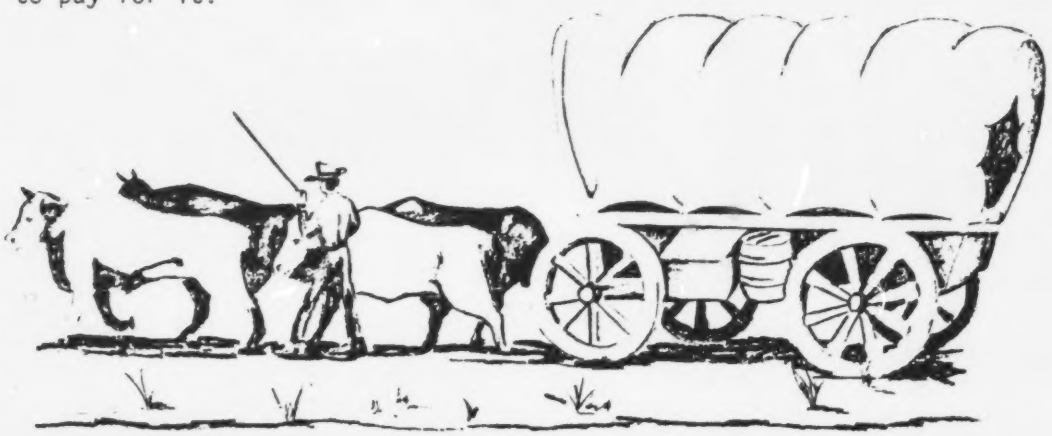
Prices change daily for many reasons. These reasons make up supply and demand. A large supply and little demand will make prices low, and a small supply (i.e., bad harvest) or a big demand (i.e., a new use found for a grain crop) will make prices rise.

The grain prices you hear quoted are also given on the basis of grade. The radio or newspaper price is usually what is being paid at a big market, like Chicago, for a certain grade of grain--usually U.S. No. 2. Do you know why we have these grades or where they began?

Early in the history of our country most of the grain produced was not sold at all but kept and used right on the farm. In order to sell grain there had to be a surplus and too often there wasn't even enough. As settlers moved west and became established on the plains, the land produced a bounty.

In 1848 hundreds of farmers were coming to Chicago to sell wagon loads of the wealth of the prairie--grain. Hundreds of buyers waited for them with ships and barges to take it east. Even after the Chicago Board of Trade opened that same year, sellers had no way to prove the quality of their grain, which was usually stored in warehouses when it arrived, and buyers had no way of knowing if the grain they bought was dry or wet, moldy or fresh, heavy or light.

The businessmen who organized the exchange in Chicago saw the need to have uniform standards for grain, so they established this country's first grain grading system. Later the government established official U.S. grades. Today there are official grades for every commercial grain grown in this country. The higher the grade the more buyers are willing to pay for it.



Grain grading is important to farmers because it assures them that they will get the price their grain is worth. It is important to buyers because it assures them of getting the quality of grain they are paying for. In other words the livestock feeder can determine if it is good enough for feed and the shipper can tell if it is dry enough to safely store on a long trip overseas.

GRADE	MINIMUM TEST WEIGHT PER BUSHEL	MAXIMUM LIMITS OF -			
		MOISTURE	BROKEN CORN & FOREIGN MATERIAL	DAMAGED KERNELS	
				TOTAL	HEAT-DAMAGED
	POUNDS	PERCENT	PERCENT	PERCENT	PERCENT
1	56	14.0	2	3	0.1

FIG. 2. CORN GRADING CHART

Here are the requirements for corn to grade U.S. No. 1. Can you think of reasons for each requirement?

In addition to the regular grade requirements which you see listed in Fig. 2 for U.S. No. 1 corn, there are special grades which can be attached to the regular grade to explain any special problem the corn may have. Special grades may include "weevily" corn or "distinctly low quality" if it contains broken glass or a large amount of rodent excreta. The same is true for other grains.

Jobs at the Elevator

Grain elevators are part of America's number one employer--agribusiness. Fourteen to seventeen million people are employed in American agribusiness, and that number--unlike the number of farmers--is growing.

- Draw a sample of grain from a car or truck
- Operate fire estinguishing equipment
- Keep work, storage, and delivery areas clean and free of leaves, litter, and snow
- Paint buildings and equipment when needed
- Keep all tools clean and properly stored
- Clean grain bins
- Use adding machine and tabulating devices to balance accounts
- Prepare scale tickets
- Repair and grade driveways
- Write up sales tickets
- Perform typing and mailing tasks
- Load grain into cars or trucks for shipment

These are the jobs Illinois grain elevator operators said beginning workers would be expected to perform.

While the farmer waits to unload grain, someone from the elevator samples the grain with long stainless steel poles called probes. The person sampling the grain must know how to correctly draw the sample. The work begins, however, after the sample has been taken.

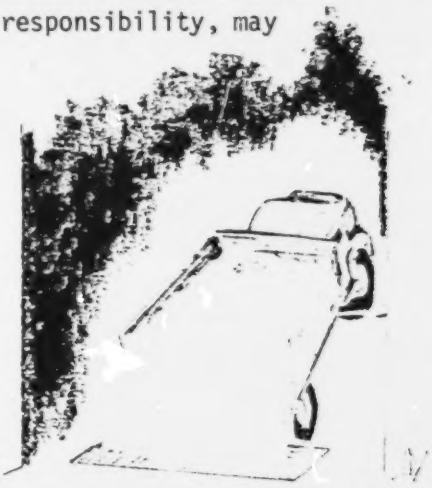
Someone, usually an experienced worker, will test (or grade) the sample. The farmer is paid on the basis of this testing, so it must be accurate. The grader must be able to test the weight per bushel of the grain. The grader must also be able to test the moisture content, the amount of foreign material, the amount and type of damage, and notice any other factor which may affect the price the elevator will pay.

There may be others working in the scale house or office with the grain tester. If the elevator is large one person may do nothing but find buyers for the elevator's grain and set the daily price the elevator will pay. This is a job requiring years of experience. The elevator may also hire a secretary who files records of all the elevator's sales. This secretary may also have to quote prices to farmers over the phone. If the elevator sells retail products other employees may be responsible for sales and keeping the stock up to date.

Working outside the elevator office are warehouse workers. They are responsible for loading and unloading the trucks, maintenance, repair, and any other jobs that turn up around the elevator. They also must know something about grain quality and be ready to stop and recheck a load of grain if they notice any pockets of poor quality grain coming off a truck.

Most workers begin as warehouse workers, but elevator managers say that a worker with a good attitude who is willing to take responsibility, may advance to a higher paying position in management.

College education is not necessary for a beginning elevator worker, but a good education may make it easier for the warehouse worker to advance. High school or community college internship programs may also help beginning workers get started by giving them jobs in the industry. Any applicant with a farm background is more likely to be hired because or prior experience with grain.



There are opportunities for advancement even beyond management of the local elevator. Large cereal and feed companies need experienced workers. State and federal governments hire grain inspectors to give official grades to samples sent in for inspection or to whole loads of grain, which are sealed after inspection.

SUGGESTION FOR ACTIVITY

On a trip to the local elevator see how many different duties you can identify. Who is responsible for cleaning the bins? Is it the same employee responsible for grading incoming grain?

Review

I. MULTIPLE CHOICE

1. Where did grain grading begin in the U.S.?

   a) Pilgrims brought it over on Mayflower
   b) Standards were imposed on farmers during the Nixon administration
   c) First established by U.S. Department of Agriculture
   d) Established privately by the Chicago Board of Trade
   e) There neither are nor ever have been nationwide grain standards in the U.S.

2. Which of the following is true concerning the price of corn listed in the paper?

   a) The price is an average of prices from around the country
   b) The price is based on the grade of grain which was sold the most that day
   c) The price is based on U.S. No. 2 yellow corn in a single large market
   d) The price is calculated from the Chicago futures price

3. The number of jobs in agribusiness is:

   a) Increasing
   b) Decreasing
   c) Staying about the same

II. SHORT ANSWER

4. Name 4 jobs available at most local elevators

   a)

   b)

   c)

   d)

5. What is one job outside of the elevator that is related to the grain storage and handling industry?

6. How does grain grading help the grain seller? The buyer?

7. Two duties of a warehouse worker are:

   a)

   b)

8. What are two ways to get a job in an elevator?

   a)

   b)

CHAPTER TWO
PRICING GRAIN

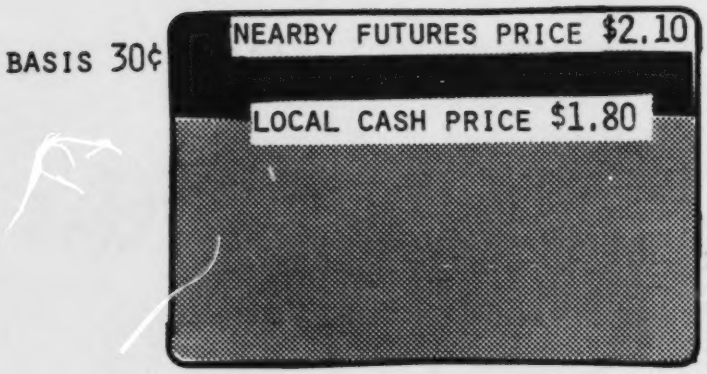
Do You Know: How an elevator makes money?
What "basis" is?
How the elevator sets the price it will pay farmers for grain?
How a grain's grade affects its price?
What options the farmer has for pricing grain?

You have already seen how important the grade of grain is to the farmer. The better the grade the higher the price. Buyers are willing to pay more for grain that is free from mold, dry enough to store well, and otherwise wholesome. If a farmer brings in a load of corn which is 20 percent moisture, the elevator manager cannot afford to pay as much for it since it cannot be stored until it is about 14 percent moisture. Besides paying for the weight of the water, the elevator would have to pay for the drying.

The factors which make up the grade--moisture content, amount of damage and weight per bushel--are all things that determine the value or price of the grain. This is why one farmer's corn may bring more than a neighboring farmer's corn sold on the same day at the same elevator.

Perhaps you have noticed that the elevator in or near your town pays less for corn or soybeans than the price given in the newspaper. For instance, if you read in Tuesday's newspaper that the price of corn in Chicago is $3.00, you may find that the local elevator is paying $2.80 for the same corn on the same day. The difference between the two prices ($.20) is called "basis". There is a reason for this basis. It reflects the cost of shipping the corn from the local elevator to a terminal market like Chicago. Other things can cause the gap between the two prices to change. An over-supply of grain nearby may cause the local price to be lower, or if several buyers are making heavy demands on the local elevator, the local price may even be higher than at the terminal market.

Two country elevators may have different bases even though they sell grain to the same buyer. One elevator that is far from a railroad or river loading terminal is at a disadvantage. Another elevator may be right on a



navigable waterway and able to pay higher prices to its customers because its transportation costs are lower.

PRICING OPTIONS

The farmer selling grain is no longer at the mercy of the grain prices on harvest day. Even if the farmer does not have on-farm storage or the means to haul grain long distances, there are still possibilities for better prices. One is to sell a futures contract. A futures contract is an agreement to deliver a designated quantity and quality of grain for a certain price at a specific place and time. Selling a futures contract in June a farmer can establish the price for a growing crop.

A second option is to store the grain at the elevator and sell it later. Of course the farmer has to pay for the storage, but if the price rises more than the cost of storage, the farmer has made a profit.

How does the elevator profit from all of this activity? First, the elevator manager can simply sell the elevator's grain at a larger market and expect to make a profit. Another source of profit is "blending". By blending grain for sale the manager can improve the quality of the elevator's grain. You will see how this can work in an example in Chapter Four. Many elevators also offer nonmarketing services which help improve their overall income. Custom grain drying and fertilizer sales are two examples.

SUGGESTION FOR ACTIVITY

Check corn or soybean prices in the paper one day in each week; on the same day of the week check the price at the local elevator and chart the basis. Do any patterns emerge over a month? a year?

Review

1) Why might two farmers get different prices for grain sold at the same elevator the same day?

2) What is basis?

3) What are two things that can cause grain prices to go up in the U.S.?

4) What are three elements of a futures contract?

   a)

   b)

   c)

5) Why might one elevator not be able to pay farmers as much for corn as another?

6) Name three ways an elevator can make money.

   a)

   b)

   c)

7) If the paper says that the price of corn yesterday was $2.10 in St. Louis for No. 2 yellow corn and the elevator was paying $1.85, what was the basis?

List the basis for the following:

	Large Market Price	Local Elevator Price	Basis
8)	$3.30	$3.00	_____
9)	$3.30	$2.90	_____
10)	$2.50	$2.45	_____

CHAPTER THREE
STORABILITY AND VALUE

Do You Know: How much moisture is allowed in No. 1 corn?
What damage might feed corn have that seed corn should not?
What factors reduce the stability of grain?
How a grain sample is drawn?
How to identify five pieces of grain testing equipment?

corn grade chart

GRADE	MINIMUM TEST WEIGHT PER BUSHEL	MAXIMUM LIMITS OF -			
		MOISTURE	BROKEN CORN AND FOREIGN MATERIAL	DAMAGED KERNELS	
				TOTAL	HEAT DAMAGED
	POUNDS	PERCENT	PERCENT	PERCENT	PERCENT
1	56	14.0	2	3	0.1
2	54	15.5	3	5	.2
3	52	17.5	4	7	.5
4	49	20.0	5	10	1.0
5	46	23.0	7	15	3.0

SAMPLE: DOES NOT MEET REQUIREMENTS OF NO. 1-5

This chart represents the official U.S. grades of corn. Federal and state grain graders grade samples strictly according to this chart. Most elevators sell to large buyers on the basis of this system. Large commodity exchanges also use this system as their means of establishing quality.

But even though these are the official U.S. grades, your elevator probably doesn't buy corn strictly on a grade basis; that is, they do not pay one price if your corn grades No. 1 and another lower price only if it grades No. 2. They may choose to set their price for the day based on U.S. No. 2 corn and discount by a few cents the price paid to farmers for each percentage point of moisture, damage, or other defect.

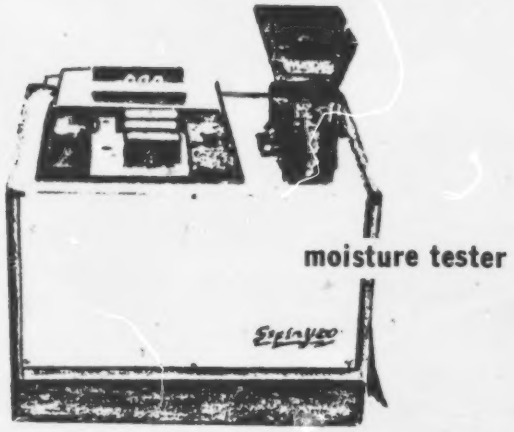
When you sell corn locally you need to understand what system your local elevator uses. For our purposes, however, we will be talking about official U.S. grades. Learning the official grading system will help you in understanding how other systems work too.

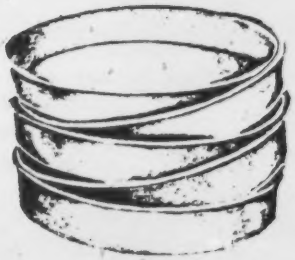
Grain is living seed. It must be kept healthy to preserve its value. The chart for corn shows what factors can damage it, lowering its price.

Of course a buyer of feed grain may want to check further than the grade designation. Checking into No. 2 yellow corn the buyer may find that it has been lowered to No. 2 because of foreign material; further checking may reveal that the foreign material is nothing worse than broken kernels of corn. Thus, its value as a feed grain would not be hurt. However, broken kernels would not be acceptable in corn kept for seed.

Factors that would harm the storability of grain (and ultimately its palatability) are moisture, because of the heating and molding that will occur, and grain damaging insects such as weevil which destroy stored grain. The palatability of the grain will be harmed by the mold and heat damage caused by moisture and by the other types of kernel damage including insect damage. Stones or broken glass also make grain worthless as feed. Foul odors are another thing that affect palatability. Cattle or hogs may not eat grain that doesn't smell like grain--and they probably shouldn't.

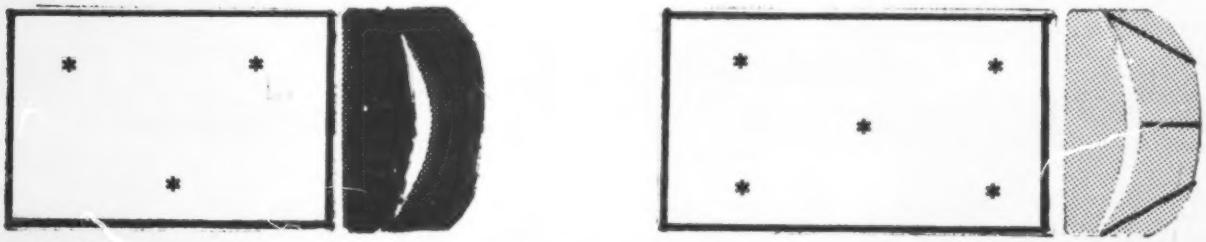
All these factors need to be tested to determine grade. Using certain tools, elevator personnel check the grain according to an established routine.





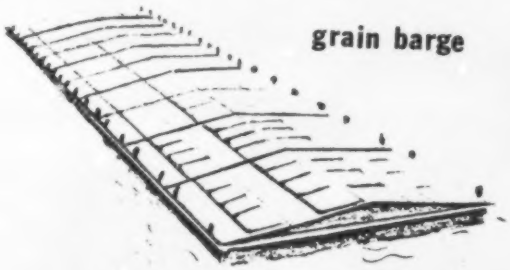
PROBING

The first step is to probe the grain. Since all the grain on a truck can't be tested, the elevator personnel try to take a sample that represents the rest of the load. This means that the probe may have to be inserted into the truck more than once. It also means that each truck should not be



probing locations

probed in the same location. Probing each truck only once and in the same location each time might result in some customers loading their best grain in that very spot. For this reason many elevator managers insist that samplers change their probing pattern for each truck. State and federal grain inspectors have strict sampling procedures. Instructions for official grain inspectors tell exactly where to probe trucks, railroad cars, and barges.



grain barge

After the sample of grain taken by the probe is brought into the scale house or elevator office, it must be checked for odor, moisture, foreign material, weight per bushel, and any other obvious fault like stones in the grain and damage.

DAMAGE

Spotting damaged kernels of corn or other grain takes skill and is usually one of the last things checked on a sample of grain. Nine types of corn kernel damage you should know are: 1) insect damage, 2) ground and weather damage, 3) sprouted damage, 4) blue-eyed mold, 5) cob-rot damage, 6) various other mold damage, 7) drier damage, 8) heat damage, and 9) damaged by heat. If "eight" and "nine" sound the same to you, it is because "damaged by heat" is just a mild case of "heat damage." Notice on the corn grading chart that "damage" and "heat damage" are separate categories and that the allowable percentages of heat damage are lower than for other damage. This is partly because "heat damage" is counted separately and included with "other damage." "Damaged by heat" is counted only in the "other damage" category; this is corn which is slightly discolored by heat.

Study the pictures in the Corn Kernel Damage pamphlet until you are confident you can pick these types of damage from a corn sample.

Review

Name five factors that can be present in corn that lower its storability or palatability.

1. _____
2. _____
3. _____
4. _____
5. _____

Short answer:

6. Why should each truck be sampled in a different location?

   _____

7. What is the difference between "heat damaged" and "damaged by heat"?

   _____

8. Name two faults that may be present in grain that may be seen even before the grain is probed.

   _____

   _____

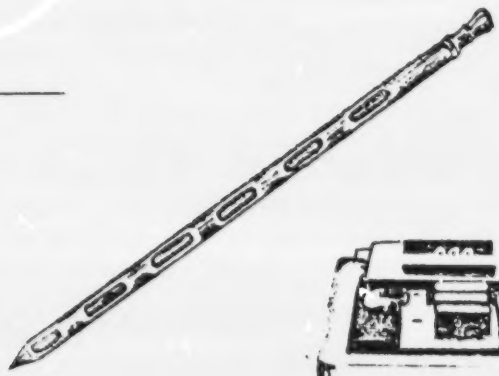
9. Name two types of damage (of the types listed in the pamphlet) and describe each type in your own words.

   a. _____ _____

   b. _____ _____

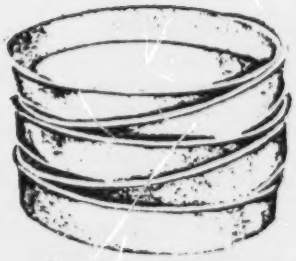
Write the names of the pieces of equipment numbered below beside the number of each.

10. _____



11. _____

12. _____



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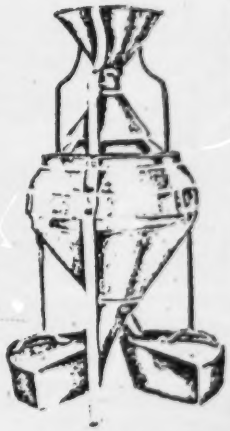


14. _____

CHAPTER FOUR
GRADING CORN

Do You Know: How corn is graded?
What equipment is used in grading corn?
What types of damage can affect corn?

If it is late October and the trucks are lined up at the elevator, the grain grader is under pressure. If the grader, or tester, over-estimates the corn's value (price) the elevator will lose money when the grain is resold. If the grain price is under-estimated, the farmers may choose to market their grain at other elevators.

The sample is drawn with a probe as explained in Chapter Three. In this case the grain is corn.

CLASS

Corn is classed according to its natural color: yellow, white, or mixed. Most corn sold in the U.S. is yellow and must be 95 percent yellow-kerneled. White corn is used mostly for human consumption and must be 98 percent white-kerneled. Mixed corn doesn't fit the classification of either white or yellow corn.

While the sample is being drawn the tester keeps alert for anything that would lower the grade. Large stones, broken glass or an excess of rodent excreta may bring the designation down to sample grade. Grain damaging insects may cause the corn to be labeled "weevily." Odors can be sour, musty or C.O.F.O. (Commercially Objectionable Foreign Odor) and will lower the designation to sample grade. Sour corn may be heating and has begun to ferment; musty corn has the smell of a

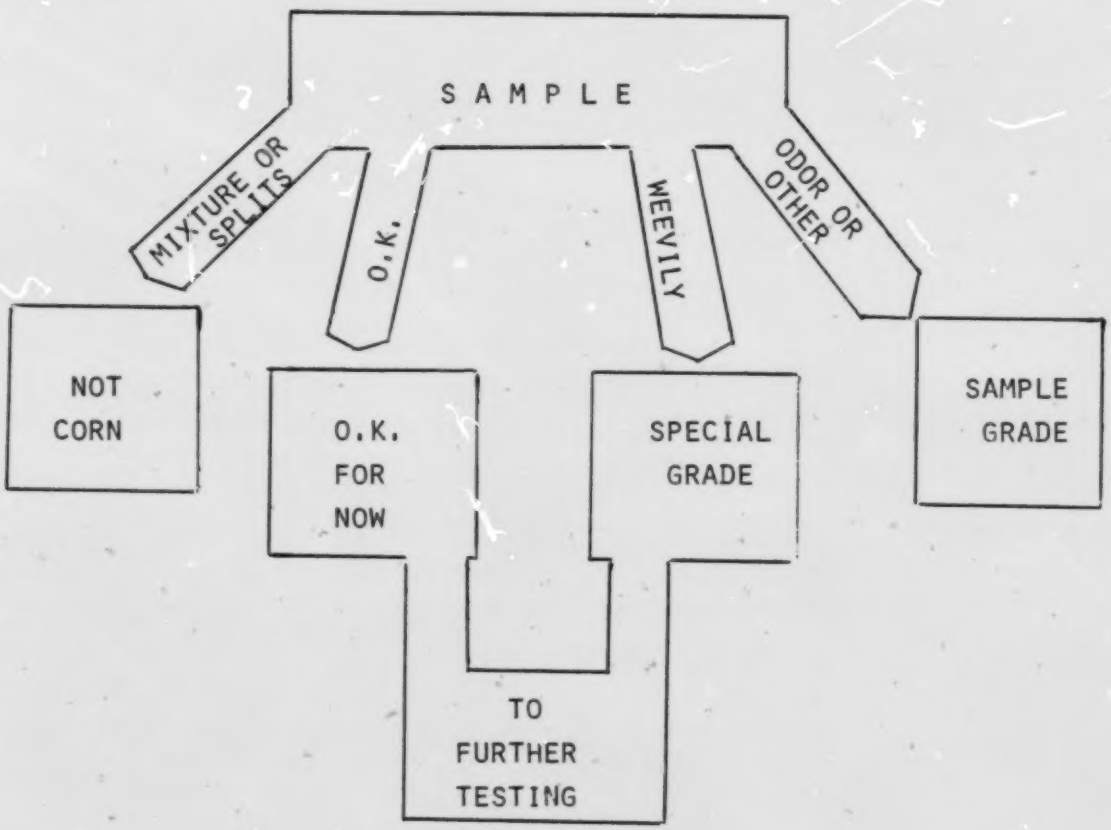
"wet basement" and C.O.F.O. includes everything from skunk to gasoline odor. All this checking has taken place before the sample is even brought into the scale house or elevator office. By this time the grading may have gone three ways: a) O.K. for now, b) special grade--weevily, or c) sample grade--distinctly low quality through odor, stones, etc.

There is even a chance that the corn sample is not even corn. Look at the official definition of corn below:

> "Corn shall be any grain which consists of 50% or more whole kernels of shelled dent corn and/or shelled flint corn (Zea mays) and may contain not more than 10.0% of the other grains for which standards have been established under the United States Grain Standards Act." (The Official United States Standards for Grain, USDA, 1978)

So you can see that a truck load of corn that is more than half split kernels or contains 12 percent wheat is not even officially "corn."

At this point the tests left to be made are the ones shown on the chart: moisture, foreign materials, weight per bushel, and damage.



The sample must be a manageable size, usually between 250 and 1000 grams (1000 grams is a little more than one quart). The size may be reduced with a Boerner Sampler if one is available.

Now the corn is tested for moisture. Most elevators have electronic equipment that will display the percentage moisture when a small sample is put into it. The amount of moisture that is measured may demand a lower grade for the corn. For instance, if the moisture is 17 percent, the corn can be graded no higher than No. 3 (see chart), but if it is 13 percent moisture it can still be considered No. 1 for now. Any of the other factors can lower the grade. Keep in mind that the grade of corn is not an average of grading factors but can be lowered any amount by any one of them. All categories of grading factors must indicate that the corn is No. 1 before it can be graded No. 1. This is true for official U.S. grades only; local elevators may determine price any way they wish. Some elevators may discount the corn a certain cash amount for every one-half percentage point of moisture.

Example:

a. 1 1/2 cents for each 1/2 percent moisture for corn containing between 15 1/2 and 20 percent moisture.
b. 2 cents for each 1/2 percent moisture for corn containing from 20 to 23 percent moisture.
c. 2 1/2 cents for each 1/2 percent moisture exceeding 23 percent.

The next test is for foreign material (F.M.). F.M. in corn is anything that falls through a No. 12 sieve (12/64 in. round hole) and anything that is not corn that is left on top of the sieve. Even broken kernels of corn that fall through the sieve are considered F.M. Suppose the sample weighs 250 g before taking the F.M.

out. If the F.M. weighs 5 g, the sample is still No. 1 corn because F.M. is only 2 percent. The other tests are made on the remaining sample of corn.

The sample can be lowered in grade for low weight per bushel. The weight per bushel tester has a one-quart bucket on one side of a balance beam. The bucket is filled till it is slightly rounded, then the top is struck off level. Now with an even bucket of corn, the beam is balanced and the weight per bushel is read from the beam. Corn must weigh 56 lb/bu to remain No. 1.

Now you are ready to figure the percentage of: a) damaged, and b) heat damaged kernels. First you must pick out the heat-damaged kernels and weigh them separately. The percentage is figured by dividing the total weight into the weight of the damaged kernels. (.5 grams heat damaged ÷ 250 grams total sample = .002 or .2 percent heat damaged. This would lower the sample to No. 2).

Example:

Total sample wt.		250 g
Heat damaged wt.	.5 g	
Other damage wt.	7.0 g	
Total damage		7.5 g

7.5 ÷ 250 = .03 or 3%
not enough to lower any sample but the sample is already at least #2 because of the heat damage.

picking damage

Now the grading is complete. Let's go through one other example.

Probing: A truck loaded with yellow corn drives onto the elevator scales. Before it does, it is probed and checked for obvious damage, like odor. It has no obvious fault.

Test H_2O: The moisture test indicates that the corn is 13.5 percent moisture.

Screen: After being split to 250 grams the sample is screened. When the large pieces of cob and non-corn material are taken out and weighed with the part that fell through the screen, the weight of F.M. is 6.25 gram.

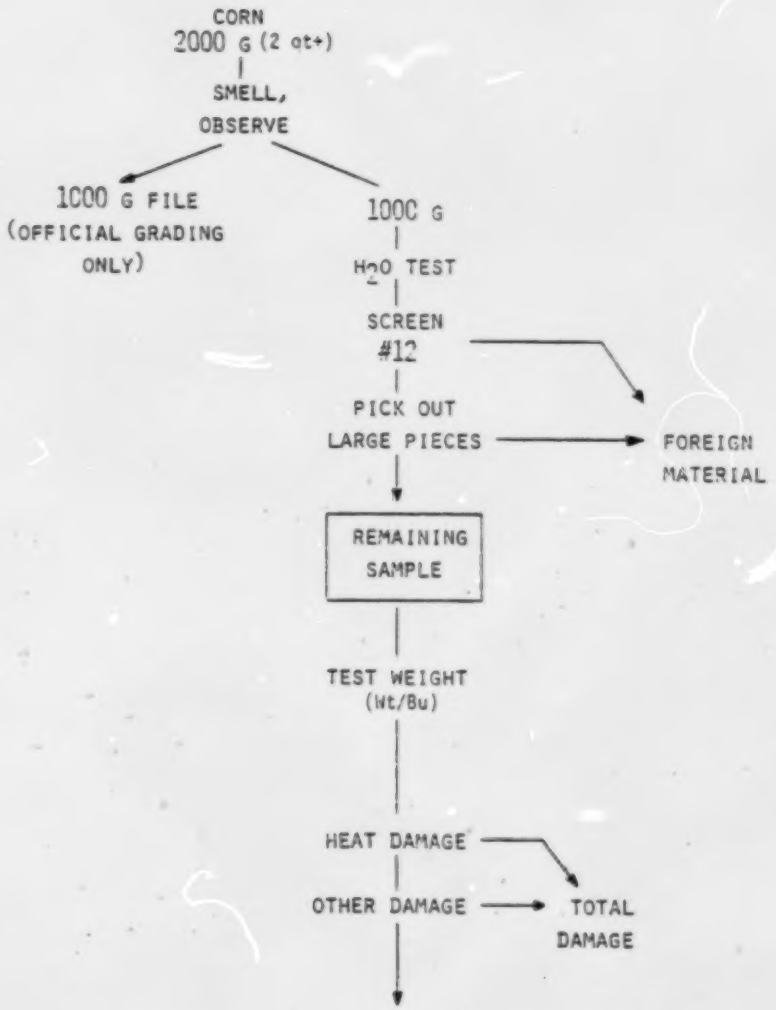
Wt./Bu.: The weight per bushel is 56.2 lbs.

Damage: A 250 gram sample is used to find damage; the damage is weighed as follows:

Heat damage	.38 gram
Other damage	7.12 grams
Total damage	7.50

Compare the results with the chart to determine the grade of the grain. If you decided U.S. No. 2, you were correct. Either heat damage or percentage F.M. would make the sample No. 2.

corn grading flow chart



Review

TRUE & FALSE

____ ____ 1. Damage is figured before F.M. is taken out.

____ ____ 2. White corn is primarily used for livestock feed.

____ ____ 3. Sample grade is below U.S. No. 5.

____ ____ 4. To determine grade various factors affecting corn are averaged.

____ ____ 5. Weight per bushel is determined using a sample from which foreign material is removed.

____ ____ 6. Heat damaged kernels are computed both in the "heat damaged" and "total damaged" categories.

SHORT ANSWER

7. When is corn not corn?_____

8. A 500 gram sample of corn is placed in a 12/64 inch sieve and shaken. Everything that falls through is placed on a scale. Next, several large pieces of cob and stalk are picked from the sample and placed on the scale also. The scale indicates a weight of 15 g. What is the percentage of foreign material in the sample? _____

9. Damage is figured on a 125 g sample. The sample is weighed and picked as follows:

Heat damage	.13 g
Blue-eyed mold and other mold	3.0 g
Sprouted damage	1.0 g

What is the grade based on the above information only?_____

10. Given the following information on a load of grain, determine the grade.

Step one: Probing
The load of corn is probed and no obvious damage is noted.

Step two: Moisture test
The moisture tester indicates that moisture in the sample is 15.4%.

Step three: Screen
Out of 250 grams screened, 8.8 grams of F.M. were removed.

Step four: Weight per bushel
The weight is 54.5 lbs. per bushel

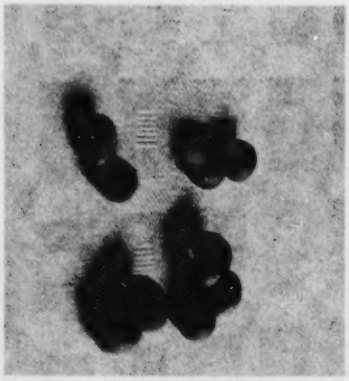
Step five: Damage
No heat damage can be found, and out of a 125 gram sample 2 grams of corn damaged by mold could be picked out.

Grade_____

CHAPTER FIVE
GRADING WHEAT AND SOYBEANS

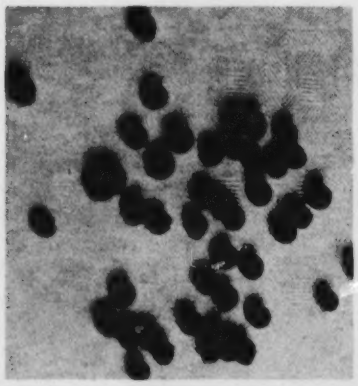
Do You Know: How to distinguish six major grain crops?
The difference in procedure between grading wheat and corn?

corn



soybeans

oats



grain sorghum

wheat

barley

rye

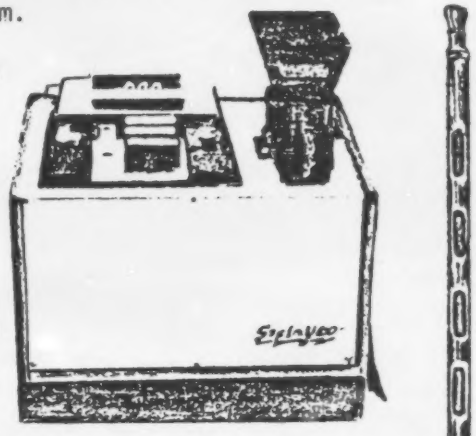
Study these pictures until you can identify each of the major grains.

GRADING SOYBEANS

Soybeans are graded much the same as corn. The grade requirements and some special grading factors are different though. These differences are listed on the following page.

1. Classes are yellow, black, brown, green, and mixed (only yellow is grown in the U.S.)
2. Screening is done through an 8/64 inch sieve.
3. The official definition is the same as for corn substituting the word "soybeans" for "corn."
4. Special grades are "garlicky," "weevily."
5. Splits and off-colored beans are counted as grading factors.
6. Soybeans can have many of the same types of damage as corn but may, in addition, contain "green immature" damage. Other grading factors include "stained and mottled" and "splits." Soybeans may be given special grade of "garlicky."

Look at the soybean grading chart and refresh your memory of the flow chart, then go through the practice problem.



Practice example: See if you can complete one grading exercise on your own.

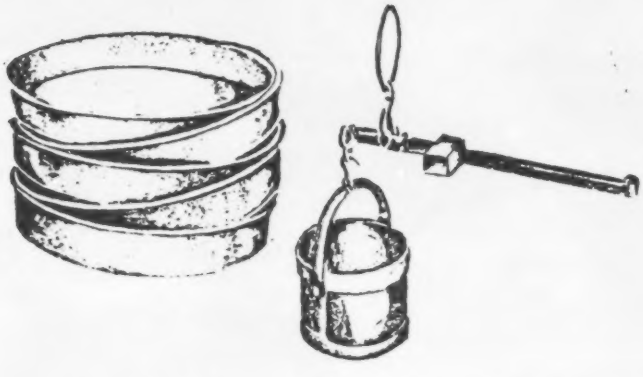
Probing: This truckload of soybeans is probed and checked for obvious damage. None is apparent.

H_2O Test: The moisture test indicates the soybeans are 13% moisture.

Screen: The soybeans are screened through an 8/64" round-hole sieve. For the 250 g sample 4.8 g are F.M.

Wt/bu: The soybeans are found to weigh 53 lb/bu.

Damage: No heat damage is present. All other damage totals 6.3 g from a 250 g sample.



From this information can you determine the grade?

U.S. No. 3 yellow soybeans is correct. The weight per bushel causes the grade to fall to No. 3, although either F.M. or total damage would make the sample No. 2.

GRADING WHEAT

The essential differences between grading wheat and grading corn are:

1. Moisture is not a grade factor in wheat as you can see from the chart. Local elevators will start discounting wheat for moisture, however, around 13.5% and federal and state inspectors will make note of the exact moisture content on the certificate of any officially graded wheat that is above 12.5%.
2. "Dockage," "Foreign Material," and "Shrunken and Broken Kernels" are all counted as grading factors in wheat.
3. Heat damage and damage are computed the same as for corn. The categories of damage are different though. The different categories of damage for wheat are "sick," "black-tip fungus," "blight and scab," "green," and "frosted."
4. There are seven classes of wheat: 1) Hard Red Spring Wheat, 2) Durum Wheat, 3) Hard Red Winter Wheat, 4) Soft Red Winter Wheat, 5) White Wheat, 6) Mixed Wheat, and 7) Unclassed Wheat.

Study the wheat grading flow chart noting the differences between it and corn and soybeans, and go over the example below. Then see if you can work the practice problem.

Example

Probing: The truckload of wheat (soft red winter) is probed and checked for obvious faults.

H_2O Test: Next the moisture test is made. If moisture is above 13.5% it may be discounted, but moisture is not a grade factor.

Dockage: A dockage machine may be used to figure dockage with different sieve attachments for each class of wheat. If 20 grams out of 1000 are dockage, 2% is dockage. (Anything less than 0.5% is not figured.) This 2% is subtracted from the total weight of the load.

Dockage is a weight discount, not a grade discount. That means that one ton of wheat that is 2% dockage is treated as 1960 lbs. of wheat.

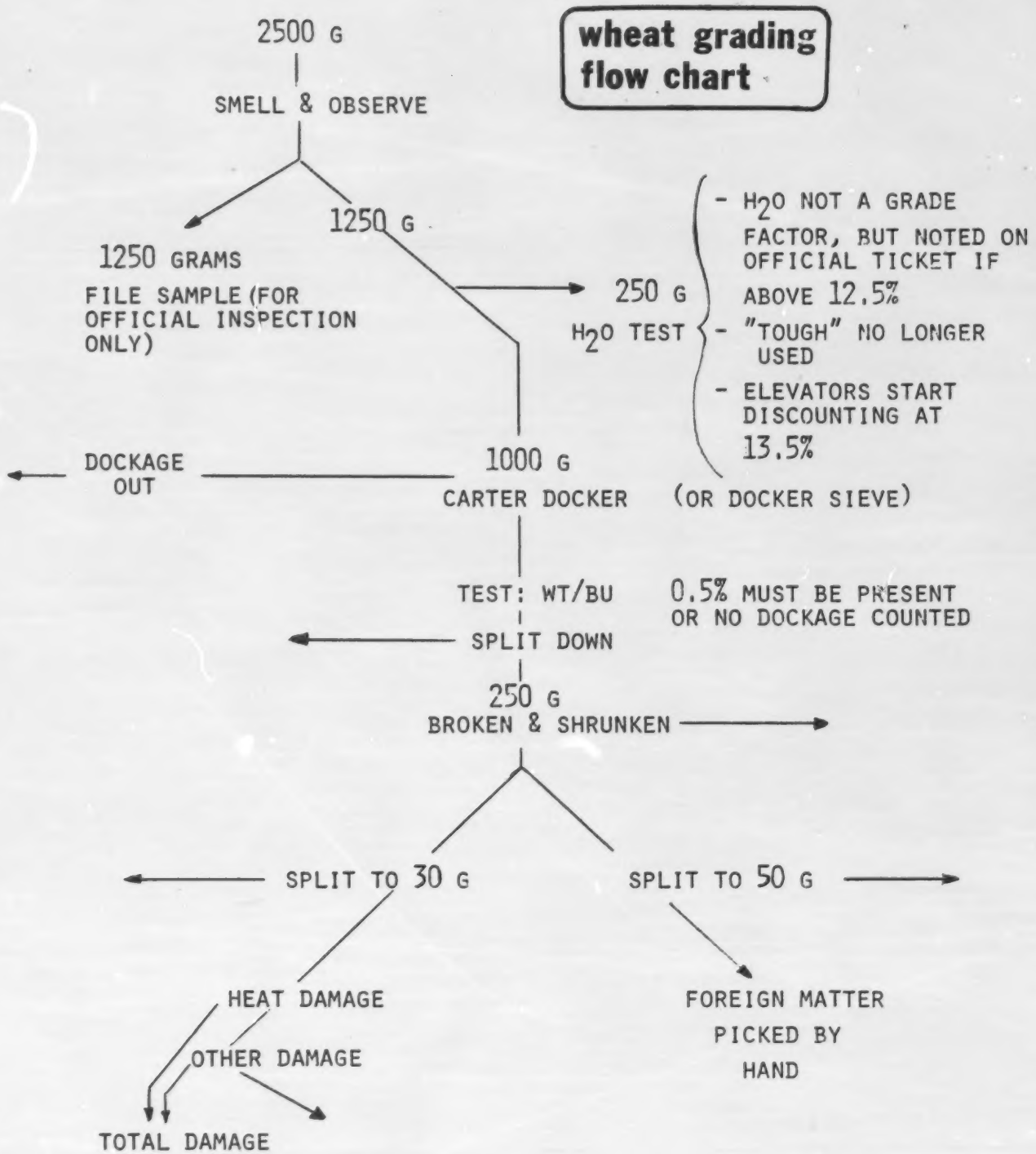
Wt/bu: Weight per bushel is measured in the same way as for corn and soybeans.

Broken & Shrunken: Broken and shrunken kernels are figured from a 250 gram sample that has had the dockage removed. Broken and shrunken kernels fall through a 3/8" oblong-hole sieve. The remainder is used to figure F.M. and damage.

F.M.: Foreign material is picked by hand out of a 50 gram sample of the remainder of the grain.

Damage: Damage and heat damage are figured from a 30 gram sample that has been left over after broken and shrunken kernels are removed. They, too, are hand picked and, like corn and soybeans, "heat damaged" kernels count in two categories: "damaged" and "heat damaged."

wheat grading flow chart



Review

True or False

1. _____ _____ Dockage does not lower the grade of wheat.

2. _____ _____ Moisture content is not a grade factor in wheat.

3. _____ _____ Damage is picked out and figured before foreign material is removed.

Grade the samples of soybeans below:

SAMPLE	T.W. lbs.	H.D.%	T.D.%	F.M.%	Splits	Brown Black or Discolored	Moisture	GRADE
4. yellow soybeans	56.5	0.0	1.4	0.6	8.4	0.8	10.4	( )
5. yellow soybeans	59.1	0.2	1.9	1.0	18.0	.8	9.9	( )
6. yellow soybeans	55.8	0.1	2.4	1.5	10.0	1.5	13.0	( )

Assign a grade to the wheat described below:

The wheat is hard red winter wheat. There are no obvious faults; the odor and color are normal. The moisture test indicates 12% of the sample is water. One thousand grams of this sample contain 10 grams of dockage. A 250 gram sample (taken from the 990 grams that have had the dockage removed) contains 4.9% broken and shrunken kernels. Foreign material is picked by hand from the remaining sample (the remaining 237.8 grams). It is found to be .08%. The test weight was determined to be 60.5 lbs. per bushel. Heat damaged kernels amount to 0.1%; the other damage is "insect bored," 2% and "sprouted," 1%.

7. What is the grade? _____

8. What is the 3/8" oblong-hole sieve used for in wheat?

   a) separates dockage
   b) separates F.M.
   c) separates broken and shrunken kernels
   d) separates damaged kernels

Blending can bring profit to the elevators. Fill in the grades below.

SAMPLE	T.W. lbs.	H.D.%	T.D.%	F.M.%	Splits	Brown Black or Discolored	H_2O%	GRADE
9. #1 Soybeans	55	0.3	2.0	1.0	10	1.0	12.5	( )
10. #2 Soybeans	57	0.2	2.0	0.5	5	0.0	13.5	( )
11. #3 Soybeans	56	0.1	1.9	1.0	15	0.0	13.0	( )

Now suppose you own an elevator. The information in #9-11 represents one sample from each of three equal-sized bins. What would happen if you blended them together to sell? To find out average all the factors from the three samples.

12. What will the mixture grade? _____

GRADE REQUIREMENTS FOR SOYBEANS

Grade	Minimum test weight per bushel	Maximum limits of—					
		Moisture	Splits	Damaged kernels		Foreign material	Brown, black, and or bicolored soybeans in yellow or green soybeans
				Total	Heat-damaged		
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	56	13.0	10	2.0	0.2	1.0	1.0
2	54	14.0	20	3.0	0.5	2.0	2.0
3*	52	16.0	30	5.0	1.0	3.0	5.0
4**	49	18.0	40	8.0	3.0	5.0	10.0

SAMPLE: Sample grade shall be soybeans which do not meet the requirements for any of the grades from No. 1 to No. 4, inclusive; or which are musty, sour, or heating; or which have any commercially objectionable foreign odor; or which contain stones; or which are otherwise of distinctly low quality.

*Soybeans which are purple mottled or stained shall be graded not higher than No. 3.
**Soybeans which are materially weathered shall be graded not higher than No. 4.

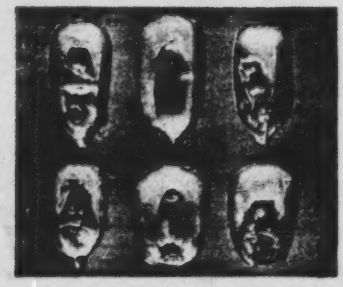
SOYBEANS

Soybeans shall be any grain which consists of 50 percent or more of whole or broken soybeans which will not pass readily through an 8/64 sieve and not more than 10 percent of other grains for which standards have been established under the United States Grain Standards Act.

CORN
KERNEL
DAMAG

PRINCIPAL CORN KERNEL DAMAGES

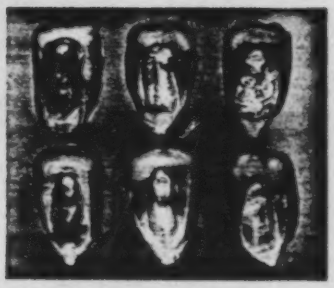
Samples pictured were selected by Joseph E. Elstner, officer in charge Kansas City Dist
U. S. Department of Agriculture, Agricultural Marketing Service, Grain Division,
passed on by Board of Grain Supervisors at Chicago.



BLUE-EYED MOLD DAMAGE
A kernel of corn, the germ of which is a
fected with blue-eyed mold.

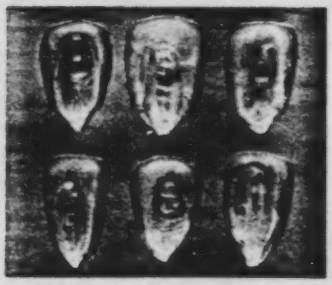
COB-ROT DAMAGE
Damage distinctly apparent and of su
character as to be recognized as damaged f
commercial purposes.

VARIOUS TYPES OF MOLD DAMAGE
Kernels of corn affected by mold; or kern
having surface mold growths are consider
damaged.



HEAT DAMAGED KERNELS YELLOW CORN

Heat damaged kernels shall be kernels and pieces of kernels of corn which have been materially discolored and damaged by heat.



YELLOW CORN SLIGHT DISCOLORATION NOT CONSIDERED HEAT DAMAGE

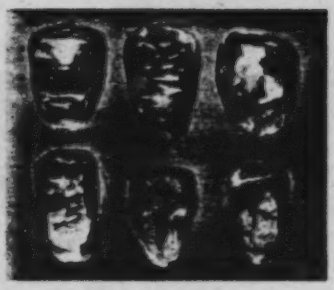
Kernels of corn which have been damaged by heat, but are not materially discolored shall be considered as damaged kernels, but not heat damaged kernels.

HEAT DAMAGED KERNELS WHITE CORN

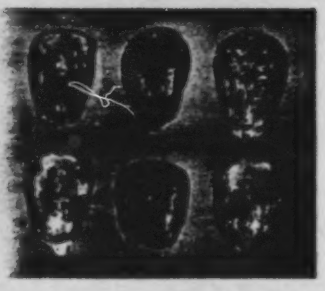
Heat damaged kernels shall be kernels and pieces of kernels of corn which have been materially discolored and damaged by heat.

WHITE CORN — SLIGHT DISCOLORATION BY HEAT NOT CONSIDERED HEAT DAMAGE

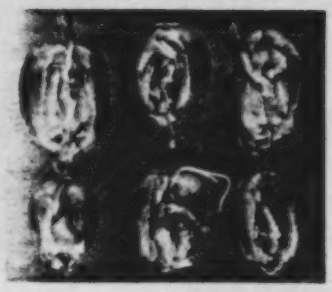
Kernels of corn which have been damaged by heat, but are not materially discolored shall be considered as damaged kernels but not as heat damaged kernels.



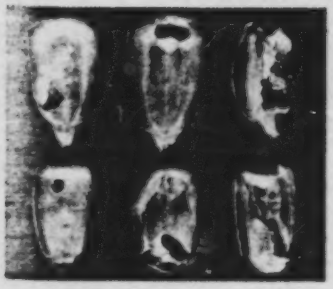
DRIER DAMAGE
When excessive heat is applied to corn to reduce moisture thereby scorching the kernel it is considered damaged. Excessive heat in drying may also result in heat damage.



GROUND AND WEATHER DAMAGE
Kernels which have been badly damaged by weather or having been on the ground.

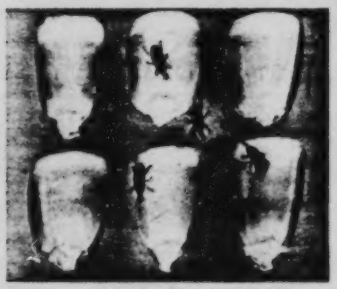


SPROUTED DAMAGE
Kernels which have the germ broken open from germination, and kernels which have sprouted are considered damaged.



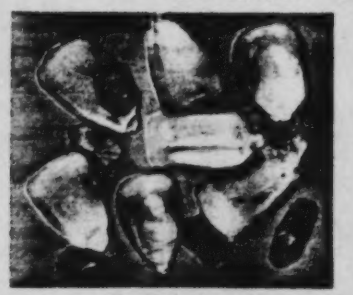
INSECT DAMAGE
Kernels which bear evidence of boring or tunneling indicating the presence within the kernel of insects, insect webbing, or insect refuse, and kernels in which webbing or refuse still remain, shall be damaged kernels. Kernels which have been partially eaten by insects or rodents but which are entirely free from refuse, webbing, or insects or other forms of damage shall be considered as sound kernels.

SPECIAL GRADES



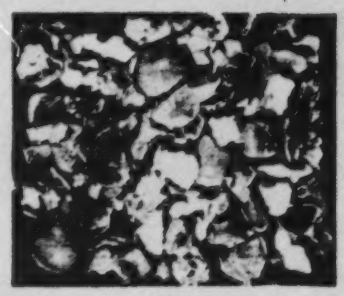
WEEVILY (Special Grade)
Weevily corn is corn that is infested with live weevils or other insects injurious to stored corn. In such cases the word "weevily" is made a part of the grade designation.

OTHER GRADING FACTORS



SAMPLE GRADE (Stones)
Corn containing in excess of seven inseparable stones or cinders which have a total weight in excess of 0.2 percent.

SAMPLE GRADE (Distinctly Low Quality)
Corn containing large pieces of glass, stones, or pieces of concrete, or corn containing rodent excreta in excess of 0.2 percent is considered as being of distinctly low quality.



BROKEN CORN AND FOREIGN MATERIAL
Broken corn and foreign material includes kernels and pieces of kernels of corn and all matter other than corn which will pass through a No. 12 sieve (12/64-inch round hole), and all matter other than corn remaining on the sieve after screening.

GRADE REQUIREMENTS

for Yellow Corn, White Corn, and Mixed Corn

Grade	Minimum test weight per bushel	Maximum limits of—			
		Moisture	Broken corn and foreign material	Damaged kernels	
				Total	Heat-damaged
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*
1	56	14.0	2	3	0.1
2	54	15.5	3	5	.2
3	52	17.5	4	7	.5
4	49	20.0	5	10	1.0
5	46	23.0	7	15	3.0
SAMPLE:	Sample grade shall be corn which does not meet the requirements for any of the grades from No. 1 to No. 5, inclusive; or which contains stones; or which is musty, or sour, or heating; or which has any commercially objectionable foreign odor; or which is otherwise of distinctly low quality.				

CORN

Corn shall be any grain which consists of 50 percent or more of whole kernels of shelled dent corn and/or shelled flint corn (Zea mays) and may contain not more than 10.0 percent of other grains for which standards have been established under the United States Grain Standards Act.

YELLOW CORN

The class yellow corn shall be yellow-kerneled corn and may contain not more than 5.0 percent of corn of other colors. Yellow kernels of corn with a slight tinge of red shall be considered as yellow corn.

WHITE CORN

The class white corn shall be white-kerneled corn and may contain not more than 2.0 percent of corn of other colors. White kernels of corn with a slight tinge of light straw or pink color shall be considered as white corn.

MIXED CORN

The class mixed corn shall be corn which does not meet the color requirements for either of the classes yellow corn or white corn and shall include white-capped yellow corn.

Revised by Robert W. Schoeff, Feed and Grain Marketing, Kansas State University, and R. E. "Gus" Page, Extension Economist, Grain Marketing, Oklahoma State University. The authors wish to express sincere appreciation to representatives of the Federal Grain Inspection Service for their assistance.

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